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## THE TORNADO OF MAY 10, 1905, AT SNYDER, OKLA.

By C. M. STRONG, Section Director. Dated Oklahoma, Okla., May 23, 1905.

The tornado apparently originated in the valley of the Red River, forming in full force over the ridge of gypsum hills, to the eastward, about twelve miles west and nine miles south of Olustee, Okla. Mr. Bowlin observed its first formation, as it assumed a funnel shape near his residence. After its full development it moved rapidly eastward with a slight southerly trend, crossed Gypsum Creek, and struck the residence of Mr. R. R. Hughes, which was totally destroyed. It then moved rapidly, with a zigzag course, trending northeastward, to a second residence, passed directly over and totally destroyed it. No loss of life occurred, but the owner had a very narrow escape, his dugout being filled with débris. Several residences were demolished by the tornado in its movement to the northeastward, but no lives were lost, the families having taken refuge in their storm caves.

It then struck the residence of Mr. G. B. Ralston, which was totally demolished. At the farm of Mr. Fourmentin the house, farming implements, and outbuildings were ruined, and several head of horses and cattle killed.

The little hamlet of Lock was destroyed. The tornado then lifted and passing eastward crossed the North Fork of the Red River at the mouth of Otter Creek.

While in its movement from the point of formation to the North Fork, the tornado was followed by rain with no electrical development; at the point of crossing the North Fork it was apparently joined by another tornado which had developed about two miles southeast of the Francis School House, and then lightning was first seen. The combined tornadoes then moved rapidly northeastward along the course of Otter Creek demolishing a number of residences.

Near the Peckham ranch the tornado left the course of Otter Creek, and moved directly northeastward one and a half miles, striking the western half of the town of Snyder[1] and demolishing everything in its path. One hundred houses were totally destroyed, the ground being stripped clean even of their foundations, while about one hundred and fifty more were badly wrecked, twisted off of their foundations, or damaged by flying timbers. Eighty-seven persons were killed or have since died of their injuries, 49 were seriously injured.

After passing through Snyder the tornado kept its northeasterly movement, destroying a couple of small residences within two miles of the town, then lifted and caused no further damage. Much of the débris was dropped to the ground in the vicinity of Oreana, Okla., while some was scattered fifteen to twenty miles northeastward over the country.

The path of the tornado showed a width varying from 300 to 1200 feet, damaging property by suction at times, within a radius of 1500 feet, this was especially noticeable at Snyder, where the damage was spread out over a half mile in diameter.

Throughout the path of the tornado the whirling effect was from right to left, or the reverse of the movement of the hands of a watch. The greater portion of the débris was thrown out in the southwest quarter of the tornado, and in nearly all instances, the houses were reduced to kindling wood, the pieces were driven upright into the ground at an angle of 45°, with the tops leaning to the west or southwest. In a few instances in the country, and quite a number at Snyder, when the buildings were at right-angles to the track and some distance away, the smaller débris was scattered directly toward the center of the path, but the heavier timbers of buildings remained intact. The destruction of the buildings, in these instances, was undoubtedly caused by the suction effects of the tornado. The suction effect was also noticeable, some buildings were pulled out of plumb and leaned to the west or northwest, they were also located on the east side of the track and about 1500 feet away from the center.

In a very few instances beams were found intact in the center of the track and parallel to it. On Otter Creek, where it passed through standing timber, the upper portions of the trees were torn, broken off, or twisted so as to show distinctly the same whirling effect.

The first appearance of the tornado was that of a black cloud from which was pendant a long funnel, almost vertical, and widening out from its base. To the people watching it from the front, this funnel during its course through Greer County, seemed to zigzag back and forth, apparently threatening all points of the compass to the eastward, and leaving no point for escape. To the people watching it from the towns to the northward, it appeared to be approaching and not until it passed to the eastward, were their fears relieved. At Olustee, Okla., the funnel shape was not noticeable until the tornado had passed to the eastward; it appeared as a broad band of water stretching from the earth to the cloud, and was at first thought to be a waterspout. To the people living in its front, the base of the funnel seemed enveloped in a cloud of steam pouring continu-

[1] Latitude 34° 39′ N., longitude 98° 56′ W.

ously in and upward. Lightning was not especially noticeable until the junction of the two tornadoes at the mouth of Otter Creek, then it was continuous and blinding.

During its passage through Greer County the rain and hail occurred after the tornado passed, but it was both preceded and followed by rain in its passage through Kiowa County.

The noise of the tornado was heard over a radius of twelve miles from its path, as a grinding, crashing roar that was indescribable.

The tornado path covered about 65 miles in length; the tornado was first observed at about 6:45 p. m., and last observed at 8:45 p. m., thus having an average forward movement of 30 miles per hour.

A peculiar feature noted and spoken of by a number of persons during the progress of the tornado over the storm caves in which they had sought refuge, was the drawing or uplifting force exerted upon them. They stated that while under the center of the storm it seemed that their bodies had lost weight and that they were gradually being drawn out of their places of refuge and had no will to resist the movement. In each case the storm door fastenings were broken loose and the doors thrown open for a short period of time, and then thrown back into position.

At the residence of Mr. G. E. Colville, a young man standing in front of the house, watching the approach of the tornado, stated that the first effect of its influence was the sudden uplifting of five bales of cotton, standing about 60 feet in front of him, to a height of about six feet above the ground, after which they were thrown back on end; then one bale was picked up and it passed through the air over his head striking the corner of the house to his rear; at the same time he was thrown forward to the ground, where, catching hold of the trunk of a small tree, he lay until the tornado had passed. While on the ground he saw the house gradually pushed backward about 30 feet, and then instantaneously go to pieces; at that instant the windmill close by was dashed to the ground. Mrs. Colville, who was in the house, escaped with only a few bruises, while the young man was uninjured. The house was about 200 yards from the center of the tornado track.

All houses and buildings along the path of the tornado, in the country, were completely demolished, and the loss to buildings amounts to $20,000. Where the tornado crossed the wire fences, the center was marked by the wires being cleanly cut through as though pliers had been used, the breaks being directly over each other in four-strand fences. In some instances, a dozen posts were pulled out of the ground, and thrown forward, the united wires forming a half circle on the ground.

## STUDIES ON THE DIURNAL PERIODS IN THE LOWER STRATA OF THE ATMOSPHERE.

By Prof. FRANK H. BIGELOW.

### VI.—GENERAL REVIEW OF THE STATUS OF COSMICAL METEOROLOGY.

#### COSMICAL METEOROLOGY.

A great advance is taking place in the science of meteorology, and this has been brought about during the past fifteen years. It has been due to two causes, the growth of modern physics, and the extension of observations into the strata of atmosphere high above the ground. The new theories of the constitution of matter, in which the emphasis is laid upon the electrical nature of the ultimate units of which atoms and molecules are constructed, and the transmission of energy in ether waves across great distances, have disposed the scientific world to examine old conclusions from a very different point of view.

(1) In 1890 the high temperature of the sun seemed to justify its exclusion from the class of magnetized spheres, and thus to separate it from the group containing the earth. Now, however, there are numerous arguments which make it necessary to reconsider that view, and to admit that the sun is probably a highly magnetized sphere which sustains a magnetic field embracing the earth in its action.

(2) Then the radiation from the sun was considered a constant quantity, but now, there are so many lines of converging evidence to show this may not be true, that the subject has become one of serious investigation, and the belief is widespread that the sun is a variable star transmitting its energy to the earth in such ways as to produce synchronous changes in its meteorological and climatic conditions.

(3) In those days the theories of the general circulation of the atmosphere, as formulated by Ferrel, were generally considered to be correct, but the explorations of the atmosphere, by means of theodolites, nephoscopes, kites, and balloons have seriously discredited all except the central idea.

(4) In the same way, the Ferrel theory as well as the Oberbeck theory of the circulation of the air in local cyclones and anticyclones, have both become obsolete, and a new type of vortex is being considered as applicable to them.

It is evident that a reconstruction of ideas is in order all along the line, and that meteorology is passing through a transition period in its development. The general outcome is to raise meteorology from a subject which was the peculiar property of the climatologist and the forecaster into one of vital interest in cosmical science, and, indeed, one which is essential to the progress of astrophysical astronomy. This change from an empirical and statistical basis, requiring merely clerical functions in those practising the art, to a plan of operations involving the highest ranges of astronomy, mathematics, and physics in its students, is one of the most hopeful signs of the times. Meteorology has really languished for the lack of a demand for high grade scholarship, but the knowledge that the observations of pressure, temperature, vapor tension, and vectors of motion in the earth's atmosphere have an astronomical value, will, of course, facilitate the introduction of methods of precision in the observations and in the computations leading to a discussion of the results.

The research that is bringing about this change in meteorology has been one of extraordinary difficulty for two or three reasons. In the first place, by the very nature of the case, meteorology must depend largely upon handling great masses of data, at least till a higher stage of classification and unification of the laws has been attained, because the action of the several elements differs greatly from one station to another over the earth, and each station must be considered on its own merits. In astronomy, on the other hand, a ready concentration of observations, made in various places upon the same celestial object, is practicable, and this coordination leads more rapidly to a final set of constants and formulæ. The astronomical ephemeris, embracing the positions of the sun, moon, planets, and stars, with their characteristic phenomena, are, thus, readily made up, and by successive comparisons between predicted and observed places a progressive accuracy has been developed. Meteorology has not yet attained the dignity of the most elementary kind of ephemeris, but has been content with striking a rough mean or normal from a large mass of crude observations. This method has no doubt been sufficient for climatological statistics, and for such forecasts as have been attempted during the past, but with the entrance of cosmical problems into the field of work that sort of procedure is entirely inadequate.

#### A METEOROLOGICAL EPHEMERIS.

As already mentioned, the first line of improvement, having in view the ultimate construction of a true meteorological ephemeris, is a careful discussion of the existing data. An examination of the available observations in the various portions of the earth, convinced me several years